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BUTTER AND OLEOMARGARINE.

THE form and character of the fats employed as articles of food vary from the raw and solid fats of the whale and seal, eaten by the inhabitants of exceedingly cold climates, to the raw and liquid fats, mostly of vegetable origin, consumed in tropical climates. In temperate climates the form, whether solid or liquid, of animal or vegetable origin, is a matter of education.

The fats present to the animal economy one of the most important functions of food, that of supplying heat and energy. "Ten grains of butter, when burnt in the body, produce heat sufficient to raise 18.68 pounds of water 1° F., which is equal to raising 14,421 pounds 1 foot high."[1]

The potential energy of fats is greater than that of nearly all other articles of food. According to Dr. Rubner, as quoted by Professor Atwater,[2] one gram of fat yields 9.3 calories, or 14.2 foot-tons; that is to say, "when a gram (one twenty-eighth of an ounce) of fat, be it the fat of the food or body-fat, is consumed in the body, it will, if its potential energy be all transformed into heat, yield enough to warm a kilogram of water 9.3° of the Centigrade thermometer, or, if it be transformed into mechanical energy such as the steam-engine or the muscles use to do their work, it will furnish as much as would raise 1 ton 14.2 feet, or 14.2 tons 1 foot."

A gram of proteine, myosin (lean) of meat, white of egg, caseine (curd) of milk, gluten of wheat, etc., or of carbohydrates, starch and sugar, yields 4.1 calories, or 6.3 foot-tons,—less than half as much energy as an equal quantity of fat. Of course, only a small portion of the whole energy is made available for external muscular work: the rest is transformed into heat. Professor von Gohren,[3] as the result of elaborate computation, reckons that a horse may transform 32 per cent, an ox may transform 43 per cent, a man may transform 53 per cent, of the whole potential energy of his food into energy for mechanical work.

In regard to the relative digestibility of butter and oleomargarine, see the article on "Foods and Food Adulterants," in *Science* of April 11, 1890, p. 229.

Butter was unknown to the ancient Greeks,—at least, no reference is made to it by Homer or Aristotle,—and even to this day is a great rarity in Mexico and South America and in certain portions of China. Herodotus and Hippocrates described, in the fifth century B. C., the butter which the Scythians obtained from mare's milk by violent agitation, and Dioscorides states that the best butter is made from sheep's and goat's milk. It was not in common use in England until after the fourteenth century. It is less frequently eaten by barbarous than by civilized nations. It is made from milk, chiefly from that of the cow. That from the bison is employed in Egypt and India, and that from the goat in other countries.

Milk is a natural emulsion, in which the globules of fat exist in a very minute state of division. Their usual size is $\frac{1}{5000}$ of an inch, but varies with the nature of the food used; and they are scattered through the whole substance as long as the fluid is in motion, but, when it is allowed to rest, these globules coalesce, and form cream.

The flavor of the butter differs according to the animal from which the milk is derived, and varies with the nature of the food, turnips and leeks imparting a peculiar strong taste. The color varies likewise with the animal and its food, from nearly white to very yellow. To give butter a uniform tint, the addition of annotto or other coloring-matter is very often resorted to.

The adulteration of butter with "additional coloring-matter" is legalized by the Oleomargarine Law,—although such addition be "intended fraudulently to conceal its inferior quality," to use the language of the British Sale of Food and Drugs Act, 1875,—and is a practice which should be more honored in the breach than in the observance than it usually is. While the coloring-matters used are harmless for the most part, their use tends to deceive the purchaser into supposing that a white, winter, is a yellow, spring, or Jersey butter.

The manufacture of butter has for its object the further coalescing of the fat-globules contained in the milk, and depends on mechanical means for its accomplishment. Butter made from whole milk, or scalded cream, contains more caseine (curd) than if made from cream in the ordinary way. This is important as not only affecting its taste, but also its keeping properties; for caseine, being a nitrogenous body, is liable to undergo fermentation, in which case the butter becomes decayed or rancid. When special pains are taken to "work the butter" thoroughly, thus more effectually getting rid of the water and buttermilk, it keeps for a much longer period in a "sweet" condition. The use of from 1 to 10 per cent of salt, and also saltpetre, as a preservative is quite common.

Ghee, which is so extensively used by the natives of India, is prepared from bison's milk. The milk is boiled, cooled, a little sour milk added, churned, hot water added, and in about an hour butter is produced. The butter is allowed to

[1] Foods, E. Smith (New York, 1874), p. 136.
[2] Century, vol. xxxiv., p. 401.
[3] Naturgesetze der Fütterung, 1872, pp. 372-378.

become rancid, when it is clarified by being boiled with dhye, or sour milk, and salt or betel-leaf, and is then kept in closed pots for use. It has a peculiar flavor, which is distasteful to Europeans.

In some parts of Europe the butter is boiled at a gentle heat for a couple of hours, with constant stirring, allowed to cool and settle, and the melted mass is decanted while still liquid into crocks, care being taken not to allow the caseine, or cheesy mass, to intermix. The butter so prepared will keep for a long time without becoming rancid.

Butter is the best-known of all non-nitrogenous animal foods (fats), but is consumed in very different quantities, varying from the large cupful, as drank before breakfast by the Bedouins near the Red Sea and Persian Gulf, to the thin layer, as eaten at most meals on the slice of bread by the inhabitants of this country.

Butter is defined by the Oleomargarine Law as the food-product "which is made exclusively from milk or cream, or both, with or without common salt, and with or without additional coloring-matter."

Butter is composed principally of butter-fat, with a small and variable quantity of water, caseine or curd, and some salt, which has been added to preserve it and bring out its flavor.

The following table shows the extremes in composition of numerous samples of butter, as found by various analysts, in regard to their proximate analyses :—

Tri-stearine, $C_3H_5(C_{18}H_{35}O_2)_3$, which occurs in almost every animal and vegetable fat. It may be obtained in a considerable degree of purity in plates of a pearly lustre by repeated crystallizations from ether. It is inodorous, tasteless, neutral, and volatilizing without decomposition under reduced pressure. It is solid at all ordinary temperatures. Its melting-point is from 52° to 69.7° C. (125.6° to 157.4° F.).

Tri-palmitine, $C_3H_5(C_{16}H_{31}O_2)_3$, which occurs in animal and vegetable fats, and especially in palm-oil, whence its name, and may be obtained by repeated crystallizations from hot ether, in white pearly laminæ. The crystals melt at from 46° to 62° C. (114.8° to 143.6° F.).

Tri-butyrine, $C_3H_5(C_4H_7O_2)_3$, which is found chiefly in butter. At ordinary temperature it is liquid, and has a distinct and peculiar taste and smell.

Tri-oleine, $C_3H_5(C_{18}H_{33}O_2)_3$, which occurs in almost every animal and vegetable fat. It is liquid at all ordinary temperatures, neutral, odorless, and tasteless.

Wein[1] found in butter-fat more or less of the glycerides of palmitic, oleic, stearic, myristic, arachidic, normal caprylic, capric, normal caproic, and butyric acids. Glycerides of acetic and formic acids were also found, but not those of propionic, valeric, oenanthylic, or pelargonic acids. The greater part consists of the glycerides of oleic and palmitic acids, that of stearic acid being usually present in smaller quantity. The characteristic constituent of butter-fat is butyrine, which ranges from 5 to 8 per cent.

Table I. — Extremes in Composition of Numerous Samples of Butters.

Analysts.	Number of analyses.	Water.			Fat.			Curd.			Salts.		
		Highest.	Lowest.	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.
König[1]	123	35.12	5.50	14.49	85.25	76.37	83.27	4.77	0.25	1.29	5.65	0.08	0.95
Bell[2]	117	20.75	4.15	14.20	93.12	72.93		5.32	0.11	1.20	15.08	0.50	
U. S. Department Agriculture[3]	52	17.44	4.44	10.49				1.23	0.26	0.60	7.10	1.08	3.27
Hassal[2]	48	28.60	4.18		96.93	67.72					8.24	0.30	
Hehner and Angell[2]	30	16.00	6.40	10.57	90.20	76.40	85.15	5.10	1.10	2.18	8.50	0.40	2.09
Ellis[4]	12	10.50	4.90		89.70	80.80		4.90	1.10		6.20	0.10	
Larue[4]	12	16.50	8.00		86.90	79.14		5.50	1.50		3.60	0.40	
Schacht	8	9.00	1.25		98.00	87.00		0.50			6.00	0.57	

[1] European markets. [2] Great Britain. [3] American. [4] Toronto.

What is commonly or commercially known as a simple fat is chemically almost invariably a mixture of several different fats, called glycerides; and the name by which they are designated terminates in "ine," e.g., butyrine, stearine, etc. These glycerides are the normal propenyl ethers of the fatty acids, or, in other words, compounds of the triad alcohol, glycerine, with the fatty acids.

Glycerine has the property of uniting with one, two, or three molecules of fatty acid, affording mono-, di-, or tri-glycerides, designated according to the acid. In almost all the natural fats these glycerides occur as trivalent; and in speaking of them the prefix "tri" is generally omitted, being understood. The most commonly occurring glycerides are,—

Olive and cottonseed oils are composed chiefly of tri-oleine and tri-palmitine.

Mutton suet consists chiefly of tri-stearine, with small quantities of tri-oleine and tri-palmitine.

Human fat contains tri-palmitine with some tri-oleine and tri-stearine.

Beef suet contains the same glycerides and the same quantity of tri-oleine as mutton suet, but the percentage of tri-palmitine and tri-stearine is about a mean between the latter fat and human fat (Heintz).

Lard has more tri-oleine than either beef or mutton suet, and less of the other two glycerides, tri-palmitine and tri-stearine.

[1] Sitzungsber. d. Phys. Med. Soc. Erlangen xi., p. 1664.

The differences in these natural fats are due to the different proportion in which these glycerides are mixed, and to such other physical differences as the various sources of the substance under examination would produce. When subjected to chemical and physical examination, a discrimination can be made between fats and oils of different origins.

According to Blyth,[1] the general composition of butter fat and butterine (oleomargarine) fat appears to be as follows:—

	Butter-Fat.	Butterine-Fat.
Palmitine	50.00	22.3
Stearine		46.9
Oleine	42.21	30.4
Butyrine	7.69	.4
Caproine and capyrline	.10	
	100.00	100.0

The following analyses, made by Drs. Brown and Mott, show the characteristic difference in the composition of genuine butter and oleomargarine to consist in the greater proportion of soluble fats contained in the former:—

	Genuine Butter.	Oleomargarine.
Water	11.968	11.203
Butter solids	88.032	88.797
	100.000	100.000
Insoluble fats:		
Oleine, palmitine	23.824	24.893
Stearine, arachine, myristine	51.422	56.298
Soluble fats:		
Butyrine, caprine, caproine, capryline	7.432	1.823
Caseine	.192	.621
Salt	5.162	5.162
	88.032	88.797

The discovery of Mége Mouries, in 1867, of a process for the manufacture on a large and cheap scale, from hitherto waste products of the large slaughter-houses, of an artificial butter, is one of the most important advances in industrial chemistry of this century. His object was to obtain a fat "which melted at almost the exact temperature of butter, possessed a sweet and agreeable taste, and which, for most purposes, could replace ordinary butter; not, of course, the finest kind, but which was superior to it in possessing the advantageous peculiarity of keeping for a long time without becoming rancid." He was employed on the Imperial Farm at Vincennes, and his experiments were undertaken at the instance of the French Government.

In 1870 a factory for the manufacture of this new butter substitute was in operation near Paris, at Poissy, and the product was called "margarine." The war then intervened, and suspended the operations of this factory; but at the cessation of hostilities they were resumed. In April, 1872, the Council of Health of the Department of the Seine, on the favorable report of M. Felix Boudet, admitted the new product to the trade under the proviso that it was not to be sold as butter. The process was patented in England in 1869, and in this country in 1873, and was described in many of the trade and scientific journals of that time.

The process of Mége may be briefly described as follows: The fat from the loins and kidneys of freshly slaughtered beeves is thoroughly washed in cold water, 16° to 18° C. (61° to 65° F.), for two or three hours, then hashed fine and melted in steam-jacketed vats, in which the temperature is carefully regulated, with the addition of a little pepsin or a portion of the finely divided stomachs of calves or pigs, together with a little caustic alkali or alkaline carbonate, at a temperature of about 45° C. (113° F.). The charge usually is, hashed raw fat, 1,000 parts; water, 300 parts; sodium, or potassium carbonate, 1 part; and stomachs, 2 parts. The mass is stirred and kept at a temperature of 45° C. for two to three hours, and allowed to settle. The melted fat is drawn off through hair sieves from the top, and run into the settling-tanks. In these tanks the fat is kept melted at 45° C. until it becomes clear; the addition of salt, about 2 per cent, hastening the operation. The mass is then cooled at a temperature of 23° to 25° C. (73° to 77° F.), whereby a large proportion of the stearine and palmitine separates in the solid state, leaving the oleine, much of the palmitine, and some stearine in a pasty state. The mass is placed in bags and subjected to hydraulic pressure. The temperature of the pressing-room is maintained at 25° C. The oily product expressed constitutes the "oleo oil," or "oleo," which is the principal ingredient of oleomargarine. The hard fat remaining in the press is turned over to the candle and soap makers. The average yield is stated to be, hard fat, stearine, palmitine, 40 to 50 per cent; oleo oil, 50 to 60 per cent. This oleo oil is nearly colorless, tasteless, and at ordinary temperature is a soft, granular fat, rather than an oil.

To make it into the artificial butter, it is necessary to impart to it the color and aroma it still lacks. For the former, annotto or turmeric is used; and for the latter, fresh milk, cream, or genuine butter. To effect an intimate mixture of the flavoring and coloring matter with the oleo, it is necessary to emulsify the fat. Mége discovered that the udder of a cow contains a substance, extractable by water, which will emulsify the fat. The operation is carried on in churns. The usual charge is, liquid oleo, 200 pounds; fresh milk, 40 to 50 pounds; aqueous extract of the udder, 40 to 50 pounds; and coloring-matter in suitable quantity. The churning is kept up for two hours at as nearly 17° C. (63° F.) as possible. The product is treated essentially in the same way as ordinary butter,— washed, drained, salted, and packed.

The yield is stated to be as follows: one ox affords 166 pounds of crude fat; 56 pounds caul fat, giving 36 pounds of artificial butter, besides 6 pounds of scrap.

Mége's original process has been modified from time to time. The use of pepsin or of calves' or pigs' stomachs has gradually been abandoned.

Though numerous patents have been taken out in this country for the manufacture of artificial butter, and materials unknown to science specified as ingredients to be used, the process employed is comparatively simple, and not patented.

The process used in this country consists in preparing from

[1] Foods, pp. 285, 287.

the suet and other fats of the beef and hog a fat deprived of the larger part of its more solid constituents, viz., stearine and palmitine, whereby a product is obtained that resembles butter-fat in certain properties.

The aim of the manufacturer is to so combine the oleo oil, neutral lard, and cottonseed oil with a certain small portion of creamery butter or cream as to produce an artificial butter having the appearance and taste of the natural product as closely as possible. There are several grades manufactured, containing a greater or lesser amount of genuine butter, which determines the price.

Sir F. A. Abel, C.B., F.R.S., in his testimony before the English Committee, stated that the process employed in one of the most extensive works in Holland was briefly as follows:—

"A quantity of milk is churned for a short time, together with a sweet oil, such as that known as ground-nut oil or sesame oil; a quantity of oleomargarine equal to about half the weight of the other ingredients is then added to this churned mixture; and the churning is then continued, at about 80° or 90° F., for about a quarter of an hour. In most cases, in order to give the true butter flavor to the butterine to a greater extent than can be obtained by the use of the milk alone, a proportion of a very strong-flavored butter, either Danish or Dutch, is added toward the close of the churning. When the mixture has been sufficiently churned, it is allowed to flow out of the churn in a stream, which meets a stream of ice-cold water. The sudden refrigeration of the mixture which I have described has the effect of preventing any crystalline formation, or the formation of crystalline particles, and produces a granular structure quite similar to the structure of ordinary butter. I should state that a small quantity of what is known as butter-coloring matter, or annotto (which is the coloring-matter used generally in the coloring of genuine butter of different descriptions), is added before the churning is completed. The butter-like substance which is obtained by the refrigerating action to which I have alluded, is passed between rolls, with the addition of a sufficient quantity of salt to render it thoroughly palatable and to preserve it; and the butterine is submitted to the usual finishing operation for sale in the market.

"Oleomargarine is the product of a treatment of what is commonly called sweet beef fat; that is to say, the fat from beef is carefully looked over in order to see that no tainted portions remain. It is then submitted to a crushing process in order that the membrane may afterwards more readily separate from the fat. It is submitted to melting, and allowed to subside for some time, so as to separate the pure fat from the membrane. The pure fat is then drawn off, and, when perfectly clear, is allowed to cool, until the mixture is rather more than semi-solid; and in that condition it is placed between cloths in a condition somewhat similar to marrow, and submitted to very powerful pressure. The hard portion of the fat remains behind as stearine, and the portion that is liquid at that temperature passes away, together with a small proportion of the harder constituents of the fat; and that constitutes the oleomargarine. In butterine there is no fat introduced except in the form of oleomargarine."

American Methods of Manufacturing Oleomargarine.

The following ingredients enter into the manufacture of oleomargarine as pursued in this country: oleo oil, neutral lard, some liquid vegetable oil (as cottonseed, sesame, or peanut); butter in the higher grades, cream, and milk, together with salt, and annotto or other coloring-matter. A brief statement of the general system pursued in the preparation of the ingredients, and of the finished products, may not be uninteresting. Very few of the oleomargarine manufacturers make their own oleo oil or neutral lard, and none of them refine or crush the vegetable oils used in the lower grades of oleomargarine, but buy them in the open market, these materials being now well-established commercial products.

The manufacture of oleo oil is generally carried on in connection with the large slaughter and packing houses situated in or near the principal cities, where every effort is made to utilize all portions of the cattle slaughtered. The caul and suet fats are removed from the freshly slaughtered beeves, and placed in tanks filled with water at 75° to 85° F., where they remain from two to three hours before being transferred to other tanks containing ice-water. By this procedure the fats are gradually deprived of their animal heat, and the danger of their becoming sour is avoided, as would happen if the mass of fat was suddenly chilled by being placed directly in ice-water. The caul, long, or slaughter fat is kept separate from the suet fat, which yields an inferior grade of oil.

A Texan steer will yield, on an average, 65 pounds of caul and suet fats, from which are obtained 28 pounds (43 per cent) oleo oil, 21 pounds (32 per cent) oleo stearine, and 12 pounds (20 per cent) high-grade tallow. The chilled fats, having been thoroughly washed to remove any blood that may be present, are then sent to the rendering tanks. These are generally in a separate building from the slaughter-house. Fat from cattle slaughtered late in the afternoon is generally kept in the ice-water tanks over night before being rendered; thus no fat is more than twelve or fourteen hours on hand, and the great majority less than four hours, before it is rendered. The fat is fed into choppers or hashers, revolving at a high rate of speed, from which it issues through fine sieves directly into the rendering-tank. This is a large steam-jacketed upright kettle of 2,000 to 5,000 pounds capacity, provided with revolving blades driven by suitable machinery. Steam being turned on in the jacket, the hashed fat is fed continuously into the tank, and kept in motion by the stirrer. When the tank is full and the contents thoroughly melted, the temperature being 120° to 155° F., the stirrer is removed, and the water and scrap allowed to settle. The clear fat is drawn off from the top, and run into the graining or seeding cars of 400 to 600 pounds capacity, where it is allowed to chill. The temperature of the room in which these cars are stored is maintained at 85° to 95° F. The fat, in chilling, naturally solidifies gradually; the hardest variety, the stearine, being the first to form a thin crust on top and sides. In from one to three days the whole contents of the car will be in a semi-solid condition. This fat is free from all "greasy" taste. The car containing the semi-solid fat is taken to the press-room, which is maintained at a temperature somewhat below that of the seeding-room, viz., 70° to 80° F., where it is dipped out by ladle and poured on a stout linen cloth, placed in a suitable depression on a wooden revolving table, and, after the cloth is properly folded so as to make a rough bag, it is transferred to the

metal plate of a screw-press. A dozen of these cloth bags cover the surface of a plate. When one plate is covered, another one is let down and filled.

When the press is filled, pressure is gradually applied by means of an endless chain revolving a screw. The expressed oil constitutes the oleo oil. This liquid fat is conducted, still hot, from the press into barrels or cars, where it is allowed to cool. The finished product is nearly colorless, tasteless, and at ordinary temperatures is a soft, granular fat, rather than an oil. The hard fat remaining in the filter-bags is removed from the press, and forms the beef or oleo stearine, which is used either for making refined or compound lard by the addition of cottonseed oil, or sold to the soap and candle makers.

The manufacture of neutral lard is conducted by essentially the same machinery and at about the same temperature employed in the manufacture of oleo oil. Only the leaf-fat of freshly slaughtered hogs is used. A hog yields from 5 to 15 pounds of leaf-lard, averaging 9 pounds, 100 pounds of which yield 90 pounds neutral. The neutral, however, is not pressed to extract the stearine, but is run directly from the rendering-tank into a very strong iced brine, where it remains for about twenty-four hours, when it is removed, and placed on shelves to drain. The neutral is a white, slightly granular, tasteless, solid fat. The skimmings and scrap from the lard-rendering kettles are strained, and the fat (about 2 per cent of the original charge) obtained from them added to the steam-rendered product. Several factories, however, use the ordinary steam and kettle-rendered lards, and not neutral. Great cleanliness is observed throughout both processes, and there is very little manual handling; machinery being used as much as possible, and the fat carefully guarded from any source of contamination.

The by-products of oleo oil and neutral — viz., stearine, tallow, and lard — are standard merchantable articles. Only fresh and sweet fats are used; and tanks, etc., are thoroughly cleaned before use, as a small amount of fat, if allowed to adhere to the apparatus, is liable to decompose in such a way as to spoil the succeeding batch of materials worked up.

Though there may be slight differences in the details, the range of temperature, size of tanks, etc., pursued by the different manufacturers, the general procedure is as above described, the object being to obtain a neutral fat, melting at butter temperatures.

The vegetable oils are prepared by crushing the seeds, etc., and subjecting the crushed mass to hydraulic pressure, or by extracting the oil by carbon bisulphide or other solvent. The crude oil thus obtained is refined to remove the coloring-matter by treatment with mineral acids, and subsequent neutralization by alkalies, and chilling and pressing, whereby a product is obtained of a light straw-color and bland taste.

The butter used is always selected for its high flavor and taste, and is generally obtained direct from the creamery. Owing to the granular character of oleo oil it becomes necessary to add some softer and smoother fat; and neutral lard and cotton-seed, or other similar vegetable oil, are added for the purpose of making the mixture more closely approach the consistency of butter. The proportions in which these ingredients are used vary with the seasons of the year, the grade desired, and the formulas of the manufacturers. The charge of milk or cream, however, is the same for all grades manufactured by any particular factory, and varies from 10 to 20 per cent. The milk or cream is allowed to become slightly sour.

The churn used is steam-jacketed, of 1,200 to 2,500 pounds capacity; and the whole operation of churning is conducted at a temperature of 85° to 105° F., insuring the melting and thorough mixture of the solid fats used, thus differing from ordinary creamery practice. The oleo oil and neutral lard are melted in separate kettles at a temperature of about 90° F. The charge of milk or cream is first run in, and the paddles kept in motion until the butter begins to form. Then the charge of melted oleo oil is added and stirred. When this is well incorporated, the neutral lard is run in, and finally the annotto, to give the desired butter-color. The butter is added either directly into the churn, being first melted, or it is worked into the oleomargarine after it is taken from the churn. The temperature is carefully regulated, being about 85° F. at the beginning, and gradually increasing to 105° F. at the end, when the whole charge has the appearance of a yellowish, creamy fluid. From twenty to ninety minutes are occupied in the churning. The whole melted charge, after it has been sufficiently churned to thoroughly incorporate all the ingredients, is run either directly into tanks containing chopped ice and constantly stirred, or is met by a stream of ice-water as it issues from the churn. The object is to give the melted mass a fine grain by this sudden cooling. The chilled mass is removed from the tanks, and placed on wooden trays to drain. Here the salt is added and allowed to work itself in, which generally takes from twelve to twenty-four hours. The salted mass is then thoroughly worked by mechanical rollers, to remove the buttermilk and water, following the general practice of creameries in this and subsequent operations of packing, etc.

Oleomargarine is placed on the market either "solid packed" or in prints or rolls. Four grades are generally made, known as "dairy" and "extra dairy oleomargarine," creamery," and "extra creamery butterine," the last two containing from 10 to 25 per cent of the best creamery butter. In the lower grades, from 25 to 60 per cent of neutral lard, from 20 to 50 per cent of oleo oil, from 5 to 25 per cent of vegetable oils, and in some cases from 2 to 10 per cent of butter, with 10 to 20 per cent of milk or cream, are the proportions used. Some factories employ no vegetable oils in their oleomargarine, preferring to use a larger proportion of neutral lard with a small amount of butter to obtain the desired butter consistency. In the higher grades the proportions of oleo oil are reduced, the vegetable oils are discarded, and creamery butter is used to make up the charge.

[To be continued.] EDGAR RICHARDS.

NOTES AND NEWS.

IT is reported that a deposit of coal of good quality has recently been discovered in West Australia.

— The enormous increase in the frozen meat export trade from New Zealand during the past few years must be exceeding gratifying to all persons interested in the colony. The value of the exports to Great Britain in 1882 amounted to only about nine two thousand dollars, while in 1887 it had risen to upwards of two million dollars. Over a million carcases of mutton are now sent annually to England, and there seems to be every prospect that the trade will go on increasing at a similarly rapid rate.